PSYCHE.

EXPERIMENTS UPON THE EFFECT OF COLD APPLIED TO CHRYSALIDS OF BUTTERFLIES.

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(*Concluded from p.* 19.)

Between 26 Feb. and 19 March 1880, there emerged, in my house, 10 examples of *Papilio ajax* from the chrysalids subjected to cold for 14 and 20 days in 1879, as related on page 4. From the lot iced 14 days emerged 2 ♂, 2 ♀; from that of 20 days, 4 ♂, 2 ♀.

From chrysalids of same laying of eggs, but which were not iced, emerged 4 ♂ 8 ♀ between 4 March and 30 March. Eight of the ten iced chrysalids gave butterflies before 2 March, and therefore 2 days before any had come from the not iced lot. The other two emerged on 18 and 19 March.

On 4 April, I examined all these butterflies and compared them with each other, and also with examples from same lot of eggs, the chrysalids of which had been iced and gave butterflies in 1879.

1. Comparing with each other: all are *telamonides*. I found no difference in shape or coloration, between the examples iced and not iced.

2. Comparing with examples from same lot of eggs, which emerged in 1879: these latter have the summer form (*marcellus*) with the coloration of the winter form (*telamonides*), wherever the change is complete; and any change at all is in the direction of the winter form (p. 5, 6). The wings are all produced, the hind margins of primaries concave; the tails very long, averaging ♂ 23.5 mm., ♀ 24.1 mm.

The butterflies of 1880 have the wings much less produced, the hind margins straight or convex; the tails short, averaging, ♂ 18.1 mm., ♀ 20.3 mm.

The icing apparently produced no effect on the chrysalids which passed the winter, except perhaps to hasten the appearance of the butterflies a few days. But the same treatment altered the markings of the butterflies which emerged in 1879.

It does not appear that the effect of the cold was really to precipitate the emerging of any in 1879, — that is, to compel any which would naturally have emerged in 1880, to do so in 1879. On examining the proportion of hibernating chrysalids from several broods of *ajax*, as recorded in Butterflies of N. A., v. 1, p. 11–13, I find that of all broods in and after May, about one-half the chrysalids gave butterflies the same year. The figures are 14-39 [0.36], 10-17 [0.59], 6-10 [0.60], 40-

76 [0.53] [average, 0.52], the first representing the earlier broods. Of the 69 pupae of June 1879 (PSYCHE, p. 4), 34 yielded butterflies the same season; and of the 35 of same lot, which were iced, 16 emerged the same season.

By this it does not appear that cold made any butterfly emerge in 1879 whose natural term was 1880. It is impossible to be absolutely certain of this fact, but the probability is very strong that the change produced by cold was in coloration, or in the clothing (as in the frontal hairs). What should have emerged in 1879 as the summer form did so emerge in shape, but presented the coloration of the winter form.

I call to mind only two species of North American butterflies in which there is a decided difference of shape between the winter and summer forms, namely, *P. ajax* and *Grapta interrogationis*. In other species, as the shape is identical in both forms, it could not be ascertained whether the application of cold had affected anything beyond the coloration or clothing.

LARVAE OF THE FAMILY *PYROCHROIDAE*.

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The larva of *Dendroides canadensis* is a type of the larvae of the *Pyrochroidae*, of which family I have bred four species, namely, *D. canadensis*, *D. concolor*, *Pyrochroa flabellata*, and *Schizotus cervicalis*. These larvae all have a much flattened and appressed body, a vertically compressed head slightly broader than the prothorax, and, attached to the final segment, a corneous plate, produced into two distant, horizontal, more or less curved processes. Three of the species are honey yellow, and approximate very nearly in size. The fourth, *Schizotus cervicalis*, is of a smoky tint and smaller. The color separates this last from the other three, which may be separated from each other by the corneous plate and processes. In *D. canadensis* the processes are nearly one third longer than the basal portion, are rather slender, regularly though moderately curved inward, and have fine granulations which are more numerous toward the tips. Between these processes at their bases, are found two small blind cavities, or *cul-de-sacs*, which do not appear at all when looked for from above.

In *D. concolor* the processes are stouter, nearly straight, and hardly longer than the basal portion. The tips are obliquely cut off on their inner side. The *cul-de-sacs* between them are larger than in *D. canadensis*, and have at their lower side a slightly projecting lip, which can be seen from above. The modification of these characters in *P. flabellata* is more marked; the processes are straight on the inner edge, still shorter in proportion to the base than in the previous species, and the granulations are much stronger. On the under side of each process, near the base, there is a tooth-like projection, and the outer edge at the base has two such projections, one smaller than the other. The *cul-de-sacs* are very large, with the projecting lip prominent and emarginate at the middle.

In conclusion a word in regard to the curious *cul-de-sacs*. They are deep, and suggest a possible organic use; but thus far, though I have carefully dissected for the purpose, I have not found that they are in any way connected with the internal organs, or have any opening into the interior of the body.